CARLA Dynamics in RL Braking System

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February 25, 2019

Dynamics Model

- Plant

$$X_{t+1} = AX_t + Bu_t$$

$$y_t = CX_t + Du_t$$

$$X_t = \begin{bmatrix} d_t \\ v_t \\ a_t \end{bmatrix}, y_t = \begin{bmatrix} d_t \\ v_t \\ a_t \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & -\Delta t & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 \\ \Delta t \\ 1 \end{bmatrix}$$

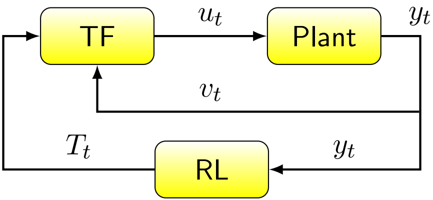
$$C = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}, D = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

- RL Controller

$$T_t = f_{actor}(y_t)$$

- Transformation

$$u_t = f_{nn}(T_t, v_t)$$



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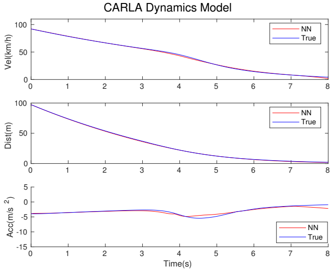

Neural Network Details

- Transformation
  $2 \times 30(\mathrm{ReLU}) \times 50(\mathrm{ReLU}) \times 1(\mathrm{Linear})$
- RL Controller
  $3 \times 30(\mathrm{ReLU}) \times 50(\mathrm{ReLU}) \times 1(\mathrm{ReLU})$